

Amendments to the Claims:

This listing of claims will replace all prior version, and listings, of claims in the application.

Listing of Claims:

1. (CURRENTLY AMENDED) A method for improved control of etch or deposition in a semiconductor manufacturing process to produce a structure having a small feature size, the method comprising:

providing an illumination source at one or more selected wavelengths;

generating from said illumination source an optical probe measurement beam;

~~illuminating an article undergoing processing with said beam~~ directing said beam onto an article undergoing processing to provide an area of illumination thereon, the article having within the area of illumination an ordered feature arrangement having a feature size of the ~~same order as the structure to be produced~~ order of the feature size of said structure and being arranged in a regular pattern having a given feature spacing or spacings;

said selected wavelength or each of said selected wavelengths being within 30% of a whole number of wavelengths of a size equal to the projection on a plane normal to the ~~illuminating radiation~~ illuminating source of said feature spacing or a respective one of said feature spacings;

detecting an oscillation of a polarization component in ~~the~~ a light beam reflected from the article being processed which is derived substantially from anomalous reflection or Rayleigh Resonance at the feature arrangement resulting from the illumination; and

using the oscillation to detect or predict ~~the desired~~ a predetermined endpoint or monitor the progress in real time of the etch or deposition.

2. (ORIGINAL) The method of claim 1, in which the ordered feature arrangement is a test structure applied to the article for the purpose of monitoring the process.

3. (CURRENTLY AMENDED) The method of claim 1, in which the ordered feature arrangement comprises structural features of the ~~desired article itself~~ article being processed.
4. (ORIGINAL) The method of claim 1, in which the article has an overlying mask which is substantially opaque to the wavelength of the illumination source.
5. (ORIGINAL) The method of claim 1, in which the ordered feature arrangement has a ratio of feature open to etch to features masked from the etch of between 5% and 95%.
6. (ORIGINAL) The method of claim 5, in which the ordered feature arrangement has a simple repeat of the etch structure.
7. (ORIGINAL) The method of claim 5, in which the ordered feature arrangement has no simple repeat of the etch structure.
8. (ORIGINAL) The method of claim 1, in which the probe beam has a linear transverse dimension of 5 μ m or more.
9. (CURRENTLY AMENDED) The method of claim 1, further including comparing the oscillation ~~information~~ with a model of ~~predicted~~ previously obtained behavior.
10. (CURRENTLY AMENDED) The method of claim 9, in which said model is created by analyzing the process critical features, which analysis takes as its input the ~~design of the dimensions of said features and their arrangement with other features in the three dimensions of the overall component~~ three dimensional arrangement with other features in the article being processed together with the optical properties of the feature materials and the illumination wavelength or wavelengths of the illumination source.
11. (CURRENTLY AMENDED) The method of claim 10, in which said analysis includes analysis of the ~~behavior of the illuminating radiation~~ illuminating source together with its polarization modes and the interference resulting from the etched (or deposited) film as its thickness varies.

12. (ORIGINAL) The method of claim 11, in which said analysis is used to provide an optimized endpoint approach using the illumination source illuminating an area of an article being processed.
13. (CURRENTLY AMENDED) The method of claim 1, including the further step of tuning the illumination ~~means~~ source to a selected wavelength.
14. (CURRENTLY AMENDED) The method of claim 13, in which said selected wavelength is chosen in dependence on the ~~material being examined~~ article undergoing processing and remains constant throughout the process.
15. (CURRENTLY AMENDED) The method of claim 13, in which said selected wavelength is tuned to a number of different wavelengths during the process, and the detected ~~signals~~ oscillations are compared with a family of predictions.
16. (CURRENTLY AMENDED) The method of claim 15, in which the family of predictions includes predictions for feature width as well as depth, and in which the results derived from tuning to different wavelengths are compared with the best fit of a family of predictions to give an estimate of the width of the ~~etch~~ feature.
17. (CURRENTLY AMENDED) The method of claim 1, in which the ~~spectrally narrow~~ illumination source is provided by combining a spectrally broad source with a wavelength discriminating means.
18. (ORIGINAL) The method of claim 1, in which the illumination source comprises light generated by the deposition or etch process itself.
19. (ORIGINAL) The method of claim 18, in which the deposition or etch process is a plasma process.

20 – 25 (CANCELLED)